SURFACE WATER POTENTIAL SUSCEPTIBILITY ANALYSIS
RISK RANKING MATRIX
FINAL SUSCEPTIBILITY ANALYSIS

THE DRAFT SUSCEPTIBILITY ANALYSIS DOCUMENT (SAD) - EPA
DATED 12/3/98

This guidance restates what the states' susceptibility analysis should contain:

1. Integrity of Wells and Surface Water Intakes
2. Sensitivity of the Setting
   a. Influences of Natural Features (e.g. slope, runoff)
   b. Influences of Human Activity (e.g. land use)
3. Identifying Significant Potential Sources of Contamination
4. Relationship Among Significant Potential Sources of Contamination, Sensitivity of the Setting and Intake Integrity

LOUISIANA'S APPROACH TO THE FOUR FACTORS

STRUCTURAL INTEGRITY (SI) (10 %)
A SENSITIVITY FACTOR

The Louisiana Department of Health and Hospitals does not have the age of surface water intakes in their records. The most practical way to quantify structural integrity of intakes is through an age ranking system as was done for wells in the ground water portion of the SWAP. The use of below water inspections is not being done in Louisiana, likely due to cost factors The contractor will determine the age of intakes and any other pertinent information relative to intakes during their contact with the water system. Once the range of system ages is determined, the contractor will set up a 1 to 10 age ranking. If data for any sensitivity component is unavailable the default will be 10. See this category in the Calculation Summary that follows.

NATURAL FEATURES FROM DATABASES (NFFD) (40 %)
A SENSITIVITY FACTOR

Influence of Natural Features

1. Length of streams in the Source Water Protection Area (SWPA) (30 %)
2. Runoff (70 %)
   a. Precipitation
   b. Slope
   c. Vegetative cover
   d. Soil permeability

Since surface water sources are open to the atmosphere, they are considered inherently sensitive. However, data collected from each system during the source water assessments will be used to develop a comparative sensitivity ranking among surface water systems.

The sources for the coverage of natural features are as follows:

1. Structural integrity of the intake – inferred from the age of the intake. The older the intake, the higher the sensitivity. The contractor will derive this information through interviews with water supply personnel.

2. Length of streams in the source water protection area - the assumption is that there is a greater potential for negative impact on surface water when the length of rivers and streams in the area is high. The stream data will be obtained from the U.S. Geological Survey 1:100,000 Digital Line Graph (DLG).

3. Runoff – there is greater potential for negative impact on the surface water when the runoff is high. Factors that influence runoff are precipitation, slope, vegetative cover, and soil permeability. High precipitation, steep slope, low vegetative cover, and low soil permeability contribute to high runoff. The precipitation data will be obtained from the Louisiana Office of State Climatology, Southern Region Climate Center at Louisiana State University. The slope data will be obtained from USGS Digital Elevation Models (DEMs). The vegetative cover data will be obtained from the U.S. Geological Survey GAP data, and in house land use maps. Soil permeability data will be obtained from the State of Louisiana Aquifer Recharge Potential Map prepared for DEQ by the Louisiana Geological Survey. DEQ later modified the map for in house use.

Natural Features from Databases (NFFD) (40% of Final Susceptibility Number is derived from this Factor)

A. Length of Streams (30% of Natural Features from Databases Factor is derived from this Feature)

The length of streams inside each delineated Source Water Protection Area (SWPA) will be determined by a GIS query of the delineated SWPA superimposed on the U.S.Geological Survey 1:100,000 Digital Line Graph (DLG) data. This query will be performed by the contractor. The delineated area will include drainage to the intake within the SWPA of the intake. The length of streams within each SWPA

will then be divided by the square miles of delineated area of each SWPA that will result in a stream length per square mile for each SWPA.

Once this calculation is performed for **all** SWPAs, each SWPA will be assigned a ranking from 1 – 10 to reflect its sensitivity due to length of streams. The 1 – 10 ranking will be derived from the logarithmic ranking formula described fully in the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6.** A "10" will represent the highest density range of streams that in turn represents the highest relative potential for negative impact.

Let's assume that the ranking for this example is "9". This ranking is then multiplied by the 30% weighting factor, resulting in a weighted result of "2.7")

B. Runoff (70% of Natural Features from Database Factor is derived from this Feature)

a. Precipitation (25%)
b. Slope (25%)
c. Vegetative Cover (25%)
d. Soil Permeability (25%)

(Each of the above components contribute 25% to the "Runoff" feature)

The databases / coverages to be used for the above components was discussed previously.

LDEQ will provide values for ranges of data for each of the above components. The ranges for Vegetative Cover are as follows:

Vegetative Cover	**Assigned Value**
Urban / Other	10
Agriculture	8
Pasture	6
Range	5
Forest	4
Wetland	2
Water	1

The following are the assigned values for each of the remaining three components:

Slope per subsegment

Range (in %)		Assigned Value
>0	≤0.002622	1
>0.002622	≤0.006877	2
>0.006877	≤0.018034	3
>0.018034	≤0.047292	4
>0.047292	≤0.124019	5
>0.124019	≤0.325228	6
>0.325228	≤0.852875	7
>0.852875	≤2.236573	8
>2.236573	≤5.865176	9
>5.865176		10

Precipitation (inches / yr)

Range		Assigned Value
> 0	?48.70	1
>48.70	?50.45	2
>50.45	?52.27	3
>52.27	?54.16	4
>54.16	?56.12	5
>56.12	?58.14	6
>58.14	?60.24	7
>60.24	?62.42	8
>62.42	?64.67	9
>64.67		10

Soil Permeability

Range	Assigned Value
Low	10
Medium	5
High	1

SOP FOR CALCULATIONS:

In order to calculate the value for the "Vegetative Cover" portion of the "Runoff" feature, the following detailed GIS methodology will be followed:

1. Display the coverage for "Vegetative Cover".

2. Overlay the coverage for "Vegetative Cover" with the delineated area of the SWPA.

3. Determine the number of types of vegetative cover that occur within the delineated area. (For example, there may be four types: forests, agricultural land, pasture and urban areas within the SWPA)

4. For **each type** of vegetative cover that occurs within the delineated area of the SWPA, perform the following calculation to determine the percent of the SWPA occupied by each vegetative cover type. For example, using the types listed in "# 3" above:

   Area of forest ? Area of SWPA = % of SWPA covered by forest
   Area of ag land ? Area of SWPA = % of SWPA covered by agriculture
   Area of pasture ? Area of SWPA = % of SWPA covered by pasture
   Area of urban ? Area of SWPA = % of SWPA covered by urban

   For example, the SWPA may have the following percentages of vegetative cover types:

   50 % Forest
   30 % Agriculture
   10 % Pasture
   10% Urban

5. Multiply each of these percentages by its assigned vegetative cover value and calculate the sum of the values. For example:

   50 % X 4 = 2.0
   30 % X 8 = 2.4
   10 % X 6 = 0.6
   10 % X 10 = 1.0

   SUM = 6.0

6. After this sum is calculated for all SWPAs, they will be ranked again from 1 – 10 using the formula described in the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6.** Let us assume for example that a sum of "6" will result in a ranking of "4".

7. Since the four components of "Runoff" are weighted equally, it is not necessary to multiply each by the .25 weighting factor. Therefore, 4.0 is the raw **and** weighted value for the "vegetative cover" component of the "Runoff" feature.

The same calculations described in steps 1 through 7 will be performed for each of the remaining three components (slope, precipitation, and soil permeability).

8. Calculate the sum of the values for each component of the "Runoff " feature. For example:

Vegetative Cover	4.0
Slope	6.0
Precipitation	8.0
Soil Permeability	1.0
SUM	19.0

Multiply the sum obtained in # 8 above by 70 % (the weighted value of Runoff ; Stream Length from "A" on page 2 of this attachment is the other 30%). Calculate the sum of these two figures.

Runoff	19.0 X 70% = 13.30
Stream Length	9.0 X 30% = 2.70
Sum	**16.00**

8. After this sum is calculated for **all SWPAs**, each SWPA will be ranked again from 1 – 10 for **NFFD** using the formula described in the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6.**

9. These rankings will be plugged into "Natural Features from Databases" portion of the **final** Potential Surface Water Susceptibility Ranking formula in order to calculate the **raw** Potential Surface Water Susceptibility Ranking for each surface water system. Finally, the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6** will be used one final time to calculate the **FINAL POTENTIAL SUSCEPTIBILITY RANKING** for each system on a scale from "1" to "10".

ANTHROPOGENIC FACTORS FROM DATABASES (AFFD)
(25% of Final Susceptibility Number is derived from this Factor)

The methodology to calculate the Land Use / Land Cover for AFFD is the same as the method used to calculate the Vegetative Cover portion of the "Natural Features from Databases" factor. Refer to step numbers one through six from the calculation SOP for Natural Features from Databases. This AFFD calculation will be performed **twice** for each of the six components of AFFD in each SWPA; once for the delineated critical area of the SWPA and another time for the delineated non-critical area of each SWPA.

CRITICAL AREA CALCULATIONS

The critical area calculation for Land Use / Land Cover (LPRCRIT), with a weighting factor of 28%, is one of six (6) components for calculating the AFFD inside the critical area. The other components are:

1. Road Length (RLC) (16%)
2. Railroads (RRC) (16%)
3. Pipelines (PLC) (16%)
4. Septic Tank Density (STDC) (16%)
5. Oil and Gas Wells (OGWC) (8%)

These five components are to be calculated in the same manner that stream length was calculated for NFFD as a length or density per unit area. Once the weighted values of each of these components is determined for all critical areas, each component will be ranked by the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6.**

All factors will then be summed after applying the weighting factor for each component. A final application of the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6** will be used to rank the AFFD (Critical Areas) on a scale from 1 - 10.

NON-CRITICAL AREA CALCULATIONS

The non-critical areas will be assessed in a similar manner with the exception that twenty-two (22) components will be used to arrive at the non-critical area rankings. These are listed with their corresponding weighting factors immediately below.
A weighting coefficient was applied to each category as determined by the Louisiana Source Water Assessment Team after the database list was finalized. The list arranged in decreasing order of coefficients is as follows for the area OUTSIDE of the CRITICAL AREA:

1.	Land Use / Land Cover (LPRNONCRIT)		19%
2.	Road Length (RLN)		6%
3.	Railroads (RRN)		6%
4.	Pipelines (PLN)		6%
5.	LASRIS Confirmed Site	(LASCONN)	6%
6.	LASRIS Potential Site	(LASPOTN)	6%
7.	TRI Sites	(TRIN)	6%
8.	Military	(MILN)	6%
9.	CAFO Site	(CAFON)	6%
10.	Chemical/ Industrial Plant Discharge	(CIPDN)	6%
11.	RCRA Sites	(RCRAN)	4%
12.	Airport	(APN)	4%
13.	Air Strip	(ASN)	4%
14.	Mine	(MINEN)	4%
15.	Oil & Gas Wells	(OGWN)	4%

16.	Cemetery	(CEMN)	1%
17.	Hospital	(HOSN)	1%
18.	Sand and Gravel Pit	(SGPN)	1%
19.	Tailings Pond	(TPN)	1%
20.	Sewage Disposal Pond	(SDPN)	1%
21.	Injection Wells	(IWN)	1%
22.	Solid Waste Disposal	(SWDN)	1%

Again, the Land Use / Land Cover component of this portion will be calculated in the same manner using step numbers one through six from the calculation SOP for Natural Features from Databases section above. The other twenty-one components will be calculated in the same manner that stream length was calculated for NFFD as a length or density per unit area. The **Surface Water Potential Susceptibility Ranking Formula of Attachment 6** will be used once again to give **each** factor a rank between 1 and 10 after the numbers are determined for each factor for all non-critical areas. All factors will then be summed after applying the weighting factor for each component. A final application of the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6** will be used to rank the AFFD (Non-critical) on a scale from 1 - 10.

Using the preceding coefficients, the following calculations would be performed separately for the Critical Areas and for the Non-Critical Areas of each Source Water Protection Area:

AFFD (Critical Areas) = (.28 * LPRCRIT) + (.16 * RLC) + (.16 * RRC) + (.16 * PLC) + (.16 * STDC) + (.08 * OGWC)

AFFD (Non-Critical Areas) = (.19 * LPRNONCRIT) + (.06 * RLN) + (.06 * RRN) + (.06 * PLN) + (.06 * LASCONN) + (.06 * LASPOTN) + (.06 * TRIN) + (.06 * MILN) + (.06 * CAFON) + (.06 * CIPDN) + (.04 * RCRAN) + (.04 * APN) + (.04 * ASN) + (.04 * MINEN) + (.04 * OGWN) + (.01 * CEMN) + (.01 * HOSN) + (.01 * SGPN) + (.01 * TPN) + (.01 * SDPN) + (.01 * IWN) + (.01 * SWDN)

As mentioned earlier, RCRA sites could be a ranked as a 3 after statewide ranges have been established for the above database categories, and this number would be placed where RCRA is in the calculation.

The following calculation will then be done by the GIS to arrive at the value for "Anthropogenic Factors from Databases" (AFFD):

AFFD = (.8 *AFFD (Critical Areas)) + (.2 * AFFD (Non-critical Areas))

This process calculates a vulnerability number for the database search that is highly sensitive in the critical area of each SWPA with an 80% weighting factor applied.

The Surface Water Potential Susceptibility Ranking Formula of Attachment 6 will be used to assign a final value for AFFD for each system between 1 and 10.

See the Calculation Summary that follows for further calculation discussion and a hypothetical example of a water system potential susceptibility analysis.

ANTHROPOGENIC FROM GROUND TRUTHING (AFGT) (25%)
A VULNERABILITY FACTOR

This involves ranking the risk of significant potential sources of contamination as **High**, **Medium**, or **Low** regarding the potential to contaminate surface water. The list of SPSOCs that will be located by ground truthing in the field (shown on page 17) will be used under this category. Next, the proximity of the activity is considered (the potential to contaminate decreases as distance from shoreline increases). Finally, the score is divided by the area of the delineated Source Water Protection Area in square miles to be able to compare relative susceptibility among systems.

Weighting of Significant Potential Sources of Contamination

A five-tier approach will be used to rate significant potential sources of contamination according to their distance from the intake. Significant potential sources of contamination within five miles of the intake are considered most critical, and five tiers will be utilized inside of five miles as follows:

Distance from Water Body	Significant Potential Source of Contamination		
	High	Medium	Low
0 - 1 Mile	25	12.5	2.5
>1 Mile - 2 Miles	20	10.0	2.0
>2 Miles - 3 Miles	15	7.5	1.5
>3 Miles - 4 Miles	10	5.0	1.0
>4 Miles - 5 Miles	5	2.5	0.5

A comparison will be made for all surface water systems. For example, an aboveground 1000-gallon diesel tank would be a high-risk activity whereas a car wash would be considered a low risk activity. The above ground storage tank would then score from a "25" (close to the intake) to a "5" (>4 Miles but < 5 Miles from the intake). The car wash would score from 2.5 to .5 depending on its proximity to the intake. Again, the assumption is that higher densities of these activities have more potential to negatively impact the quality of surface water. This accounts for types of SPSOC and their distance from the intakes for surface water being used as a drinking water supply.

POTENTIAL SURFACE WATER SUSCEPTIBILITY RANKING (PSWSR)

In each of the above categories, the results are divided into ten ranges using the **Surface Water Potential Susceptibility Ranking Formula** described in **Attachment 6**. Each range is then assigned a rating from one to ten (ten representing highest potential susceptibility) based on the spread of the numbers. The final Potential Surface Water Susceptibility Ranking (PSWSR) for each system is then calculated as follows:

PSWSR = (SI * 0.1) + (NFFD * 0.4) + (AFFD * .25) + (AFGT * .25) where:

SI	=	Structural Integrity
NFFD	=	Natural Features from Databases
AFFD	=	Anthropogenic Features from Databases
AFGT	=	Anthropogenic Features from Ground Truthing

and the multiplier is the weighting factor.

These PSWSRs can then be further divided into ranges from 1 to 10 to determine which water systems to prioritize for protection activities. It should also be noted that the arbitrary weighting of the individual indices is a collective decision made by the DEQ personnel.

The Potential Susceptibility Analysis Risk Ranking Matrix addresses the four factors described in the SAD. Intake integrity is covered under the age criteria. Natural feature influences are covered under stream length, slope, runoff, vegetative cover, and surface soil permeability. Influence of human activities and identifying significant potential sources of contamination are covered under database searches and ground truthing.

Diagrammatic Example of Surface Water Vulnerability Number Calculation

Critical Area

Using the Surface Water Supply Protection Areas diagrammatic example which follows, the vulnerability number based on Anthropogenic Data from Ground Truthing would be calculated as follows for the Critical Area:

Significant Potential Source Of Contamination	**Distance from Intake**	**Points Assessed**
#1 - Underground Storage Tank	900'	25
#2 - Car Wash	2.5 Miles	1.5
#3 - Boat Repair Shop	4.5 Miles	2.5
#4 – Promiscuous Dump	2.5 Miles	10.0
#5 - Gravel Pit	3.5 Miles	1.0
#6 - Dry Cleaner	4.9 Miles	5.0
TOTAL POINTS		**45.0**

Assume that the Critical Area is five (5) square miles. The point density for Ground Truthed Anthropogenic Significant Potential Sources of Contamination would be 9.0 points per square mile (45/5). After **all** Ground Truthing is completed for **all** Surface Water Critical Areas, this number would be ranked from 1-10 by applying the logarithmic formula described in the **Surface Water Potential Susceptibility Ranking Formula of Attachment 6**.

Again, using the Surface Water Supply Protection Areas diagrammatic example which follows, the vulnerability number based on Anthropogenic Data from the Database Search would be calculated as follows for the Critical Area:

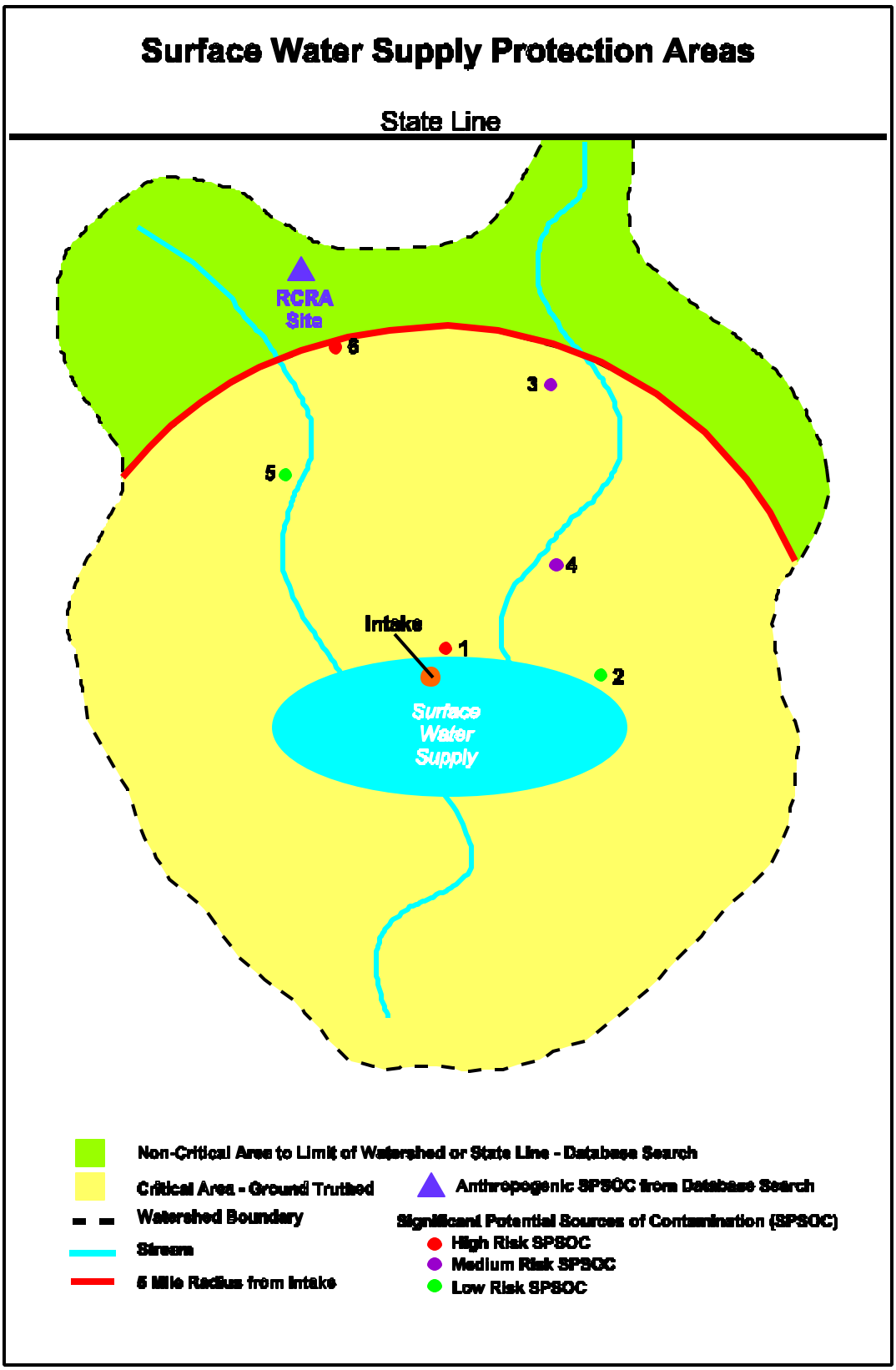
No Significant Potential Sources of Contamination from a Database Search fall inside the Critical Area. This would generate a point density of zero.

Non-Critical Area

Using the Surface Water Supply Protection Areas diagrammatic example, the vulnerability number based on Anthropogenic Data from the Database Search would be calculated as follows for the Non-Critical Area:

Assume that the Non-Critical Area is 25 square miles. There is one RCRA facility in the Non-Critical Area as determined by a database search, resulting in a point density of .04 points per square mile (1/25). After **all** database searches are completed for **all** Surface Water Non-Critical Areas, this number would be ranked from 1-10 by applying the logarithmic formula discussed in **Attachment 6**. The same calculation would be performed for **all** factors such as railroads, highways, LASRIS sites, etc.

Finally, the computation described in the Surface Water Potential Susceptibility Analysis Risk Ranking Matrix would be applied to arrive at a final Vulnerability Number that takes into consideration ground truthing within the Critical Area and Database Searches inside the Critical and Non-Critical Areas. Ground truthing and database searches each contribute 25 % of the final Susceptibility Analysis. 80 % of the Database Search number is derived from the Critical Area while the remaining 20 % is derived from the Non-Critical Area. The remaining 50 % of the final Susceptibility Analysis consist of Natural Features from Databases (40 %) and Structural Integrity (10 %).


Surface Water Supply Protection Areas
State Line
RCRA Site
6
3
5
4
Intake
1
2
Surface Water Supply
Non-Critical Area to Limit of Watershed or State Line - Database Search
Critical Area - Ground Truthed
Watershed Boundary
Stream
5 Mile Radius from Intake
Anthropogenic SPSOC from Database Search
Significant Potential Sources of Contamination (SPSOC)
High Risk SPSOC
Medium Risk SPSOC
Low Risk SPSOC

SIGNIFICANT POTENTIAL SOURCES OF CONTAMINATION AFFECTING SURFACE WATER TO BE IDENTIFIED BY DATABASES (outside of Critical Area)

Higher Risk

Chemical/Industrial Plants
Concentrated Animal Feeding Operations (CAFOs)
Military Facilities
LASRIS Sites (Superfund)
TRI Sites (Toxic Release Inventory)

Medium Risk

Airports
Airstrips
Mines
RCRA Sites (Resource Conservation & Recovery Act)

Lower Risk

Cemeteries
Hospitals
Injection Wells (all classes)
Sand & Gravel Pits
Sewage Disposal Ponds (Oxidation Ponds)
Solid Waste Disposal Facilities (Landfills)
Tailings Ponds

Line Potential Sources of Contamination

Railroads, Pipelines, Roads, and Hazardous Waste Transportation Routes are Line Potential Sources of Contamination subject to spills and leaks. They will be rated based on a pertinent number per square mile in the delineated area.

Oil & Gas Wells

Oil & Gas Wells will be reported as the number of wells per square mile in BOTH the critical and non-critical areas.

*** Other important but not quantifiable considerations at this time include natural occurrences, saltwater intrusion, silviculture, and recreational use.**

It should be noted that some of these facilities could be classified under more than one category. For example, a Chemical/Industrial Plant is also a RCRA facility and is also likely included in the Toxic Release Inventory (TRI). However, each facility will only be classified **once** and counted once. If risk rankings are different for each applicable classification the highest ranking will be used.

SIGNIFICANT POTENTIAL SOURCES OF CONTAMINATION AFFECTING SURFACE WATER TO BE GROUND TRUTHED (w/in Critical Area)

Higher Risk

Above Ground Storage Tank
Agriculture Chemical- Formulation/Distribution (pesticide/insecticide)
Animal Feed Lots/Dairies (Concentrated Animal Feeding Operations - CAFOs)
Battery Recyclers
Body Shop/Paint Shop
Bridges and Bridge Abutments
Chemical/Industrial Plant
Dry Cleaner/Laundromat
LASRIS Site (Superfund)
Military Facility
Oil/Gas Tank Battery
Petroleum (includes bulk plants)
TRI Site (Toxic Release Inventory)
Truck Terminal
Underground Storage Tank
Wood Preserving Plant

Medium Risk

Airport/Airstrip
Auto/Boat/Tractor/Small Engine Shop
Furniture Stripping
Mine
Plant Nursery
Promiscuous Dump
Railroad Yard - Switching
Railroad Yard- Loading and Offloading
Railroad Yard- Maintenance
RCRA Facility (Resource Conservation & Recovery Act)
Sewer Treatment Plant

Lower Risk

Asphalt Plant
Car Wash
Cemetery
Funeral Home
Golf Course
Hospital
Injection Well (all classes)
Lumber Mill
Marina
Metal Plating/Metal Working
Nuclear Plant
Oxidation Pond
Paper Mill
Pipeline Compressor Station
Port Facility
Power Plant
Printing Shop
Salvage Yard
Sand and Gravel Pit
Sanitary landfill/Solid Waste Disposal (active or inactive)
Sewer Lift Station
Ship Building Operation
Tailings Pond

**** Septic systems will be physically counted within the critical area and reported as a density per square mile.**

CALCULATION SUMMARY

POTENTIAL SUSCEPTIBILITY ANALYSIS RISK RANKING MATRIX FOR SURFACE WATER SYSTEMS

SURFACE WATER - SENSITIVITY

AGE OF INTAKE 10%

A 1 to 10 (10 is the worst and 1 is the best) ranking will be determined for each water system based on statewide rankings of age of intakes. This figure will carry 10% of the Potential Susceptibility figure for each water system.

NATURAL FEATURES - DATABASE 40%

Again, a 1 to 10 ranking will be determined for each water system based on statewide rankings for stream or river length per unit area and runoff in the source water protection area. Runoff rankings will be determined from the sum of its components after each of them is ranked. Then the ranking will be determined for runoff based on statewide rankings. The stream or river length and runoff rankings will be multiplied by the weighting coefficient for each (30% and 70%). This figure for each water system will then account for 40% of the Potential Susceptibility figure for each water system. Then a 1 to 10 ranking will be applied again by comparing all systems statewide.

Stream Length 30%
Runoff 70%
- Precipitation
- Slope
- Vegetative Cover
- Soil Permeability

SURFACE WATER - VULNERABILITY

ANTHROPOGENIC – DATABASE 25%

Critical Area = 20% (Reflecting 4 times weighting @ 80% for critical area calculations vs. non - critical area @ 20% as shown on page 7).

Non-Critical Area = 5%

A weighting coefficient based on SPSOC categories is applied for a total of 100% (see the example on page 6).

For each critical and non-critical area in each SWPA the density per square mile for each SPSOC is determined.

When all systems are completed a comparative analysis is done whereby each SPSOC figure (e.g. RCRA sites) is ranked by the 1 to 10 ranking formula for the critical area for that water system and the non-critical area for that water system based on statewide density rankings. Once these figures are determined they are multiplied by the weighting coefficients (discussed above and shown on page 4). Then this weighted total of the SPSOC for each water system is determined by critical area and non-critical area (see page 7).

To reflect the higher vulnerability of the critical area, the total of the SPSOC (discussed immediately above) is multiplied by 80% and the total of the SPSOC for the non-critical area by 20% (page 7). This is the input information for determining the figure for the Anthropogenic Database vulnerability for each water system. This figure is then broken into the 1 to 10 ranking based on statewide comparison and will represent 25% of the Potential Susceptibility figure for each water system.

ANTHROPOGENIC - GROUND TRUTHING 25%

Based on the risk factors for SPSOC and their distance from the intake, figures are totaled (see page 9) for a water system in the ground truth area. After all ground truthing is completed for all surface water critical areas, the figure referred to above is ranked from 1 to 10 based on statewide rankings. This figure will carry 25% of the Potential Susceptibility figure for each water system.

POTENTIAL SUSCEPTIBILITY RANKING STATEWIDE

The potential susceptibility ranking of each surface water system relative to other water systems in the state can then be determined from the above information using the formula that divides the data into rankings from 1 to 10. This ranking will then determine which water systems to prioritize for protection activities with 10 being the worst and 1 the best.

EXAMPLE CALCULATION FOR ONE WATER SYSTEM USING THE CRITERIA (HYPOTHETICAL)

THE GIS WILL PERFORM THE FOLLOWING CALCULATIONS:

Age of Intake 10%

Based on statewide ages relative to this system, after applying the ranking formula, this system ranks a 3. Therefore, the Age of the Intake ranking for this system is 3 * .10 = **.3**.

Natural Features – Database 40%

Stream Length = 4, after applying the ranking formula to statewide stream data.

Runoff - after applying the ranking formula to statewide data for each of the following:

Precipitation = 6
Slope = 3
Vegetative Cover = 2
Soil Permeability = 5

Total (Runoff) = 16
Runoff = 5 after applying the ranking formula to statewide runoff data.

Stream Length = 4 * .30 (weighting) = 1.2
Runoff = 5 * .70 (weighting) = 3.5
Total = 4.7 and after applying the ranking formula to statewide natural features data = 5

The Natural Features – Database ranking for this water system is 5 * .40 = **2**.

Anthropogenic - Database 25%

Critical Area

Land Use/Land Cover = 7, Road Length = 4, etc. (as shown below) after applying the ranking formula to statewide data and this figure is multiplied by the weighting coefficient of 20% (See page 6). This methodology is applied below.

Land Use / Land Cover	= 7 * .28	=	1.96
Road Length	= 4 * .16	=	.64
Railroads	= 5 * .16	=	.80
Pipelines	= 6 * .16	=	.96
Septic Tank Density	= 2 * .16	=	.32
Oil & Gas Wells	= 9 * .08	=	.72
Total			5.40

Non-Critical Area

Assume = 2.15 using same methodology as above.

Critical Area = 5.40 * .80 (weighting) = 4.32
Non-Critical Area = 2.15 * .20 (weighting) = .43

Total = 4.75

Using the ranking formula on a statewide basis for this category, 4.75 = 6.

The Anthropogenic – Database ranking for this water system = 6 * .25 (category weighting) = **1.50**

Anthropogenic – Ground Truthing 25%

Using the example on pages 10 and 11, the ground truth ranking is 9.

Using the ranking formula on a statewide basis for this category, 9 = 6.

The Anthropogenic – Ground Truthing ranking for this water system = 6 *.25 (category weighting) = **1.5**

POTENTIAL SUSCEPTIBILITY RANKING STATEWIDE

Age of Intake = **.3**
Natural Features Database = **2**
Anthropogenic – Database = **1.5**
Anthropogenic – Ground Truthing = **1.5**

Total = **5.30**

The number **5.30** for this water system is compared to the final number of all of the other surface water systems using the ranking formula on a scale of 1 to 10. Based on where this system ranks relative to the rest of the systems, it is prioritized for water system protection activities, with 10 being the worst (most in need of protection activities) and 1 being the best (lower priority for protection activities).